SECTION 06100- MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood grounds, nailers and blocking.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A153: Specification for Zinc Coating (Hot-Dip) On Iron And Steel Hardware.
2. A307: Specification for Carbon Steel Bolts And Studs, 60,000 PSI Tensile Strength.
3. A563: Specification for Carbon And Alloy Steel Nuts (Metric).

B. National Institute of Standards (NIST)

1. PS 1 - U S Product Standard for Construction and Industrial Plywood.
2. PS 20 - American Softwood Lumber Standard.

C. American Wood Preservers' Association (AWPA)

1. C9 – Plywood, Pressure Treatment
2. C20 - Structural Lumber, Fire-Retardant Pressure Treatment.
2. C27 - Plywood, Fire-Retardant Pressure Treatment.
3. M4 - Standard for the Care of Preservative-Treated Wood Products.

D. Southern Pine Inspection Bureau (SPIB)

1. Standard Grading Rules for Southern Pine Lumber, 1994.

E. American Plywood Association (APA)

1. APA Product Guide.

F. Federal Standards (FS)

1. FF-N-105

1.3 SUBMITTALS

A. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

B. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.

C. Warranty of chemical treatment manufacturer for each type of treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
4. SPIB - Southern Pine Inspection Bureau.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.

D. Sizes: Provide nominal sizes indicated, complying with PS 20 except where actual sizes are specifically noted as being required..

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.
2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through contain colorants, or otherwise adversely affect finishes.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb./cu. ft. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Pressure treat wood members in contact with ground with waterborne preservatives to a minimum retention of 0.40 lb./cu. ft.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Treatment Types: Interior Type A for protected wood and Exterior for wood exposed to weather.

B. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.4 BOARDS

A. Exposed Boards: Where boards will be exposed in the finished work, provide the following:

1. Moisture Content: 19 percent maximum.

2. Species and Grade: Southern pine, C Finish per SPIB rules.

B. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content and of following species and grade:

1. Species and Grade: Eastern softwoods, No. 3 Common per NELMA rules.

2.5 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items are not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number or poor arrangement of joints.

B. Cut and fit miscellaneous carpentry accurately. Install members plumb and true to line and level.

C. Coat cut edges of preservative-treated wood to comply with AWPA M4.

D. Countersink nail heads on exposed carpentry work and fill holes.

3.2 WOOD GROUNDS, NAILERS, AND BLOCKING

A. Install where shown and where required for screeding or attaching other work. Cut and shape to required size. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 06100

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SECTION 07543 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanically fastened TPO membrane roofing system.
2. Vapor retarder.
3. Roof insulation.

B. Verify existing metal deck is in acceptable condition to receive new roofing system.

1.2 DEFINITIONS

A. TPO~~:~~ Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-135.

2. Hail Resistance: SH.

D. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products. Roofing system shall meet R-30 insulation factor.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Adhesives: Provide VOC Documentation

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B. Shop Drawings: For roofing system. Include site specific plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Qualification Data: For qualified Installer, manufacturer and inspector.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

F. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

G. Field quality-control reports.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Inspector Qualifications: Provide qualifications of a roofing consultant who shall be responsible for field quality control. Inspector shall be an independent testing and field quality control professional with a minimum 5 years experience in similar project size, complexity and system to conduct testing indicated.

D. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

G. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with FAA, COTR, Government's insurer if applicable, testing and inspecting agency representative, roofing ~~in~~Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

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1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, and other components of membrane roofing system.
2. Warranty for roofing system shall be a no dollar limit for labor and materials.
3 Under natural disaster limitations the peak wind gust at 10 meters above ground value shall be 75 mph.

~~3.~~4 Warranty Period: 20 years from date of Substantial Completion.

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B. Puncture Resistance Warranty: In addition to Special Warranty, Contractor agrees to repair and replace all or part of components of membrane roofing system caused by accidental punctures. Provide a no dollar limit, 20-year warranty.

C. One-Year Warranty Inspection: As part of the one-year warranty inspection, the COTR will conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C 1153. The Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration, at no additional cost to the FAA.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by Stevens Roofing Systems; Division of JPS Elastomerics. Other available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle SynTec Incorporated.
~~b.Firestone Building Products Company.~~
~~c.Johns Manville.~~
~~d.Mule-Hide Products Co., Inc.~~

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2. Thickness: 80 mils, nominal with a minimum of 34 mils above scrim.
3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 45 mils thick, minimum, of same color as sheet membrane. Use 60 mil thick unreinforced thermoplastic polyolefin sheet flashing at parapet, same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based. Use to be confirmed by COTR and shall have low odor.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, pre-punched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 5/8 inch thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Georgia-Pacific Corporation; Dens Deck.

2. Substrate boards shall be placed directly on metal deck with fasteners.

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B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof

2.4 PROTECTION BOARDS

A. Protection Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 1/2 inch thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Georgia-Pacific Corporation; Dens Deck.

2. Protection board shall be placed on top of rigid insulation; roof membrane shall be placed directly on protection board forming roof assembly.

2.5 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm:

1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Composite Polyisocyanurate Board Insulation: ASTM C 1289, with factory-applied facing board on one major surface, as indicated below by type, and felt or glass-fiber mat facer on the other.
1. Type V, OSB facer, 7/16 inch thick.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that metal deck is acceptable for installation of roofing system.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Close all fresh air intakes/louvers where dust and odors from the roofing activities could enter the building.

E. Coordinate with the COTR the timing of the roofing removals and installation activities with the least potential for disruption of building operations.

3.3 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.4 PROTECTION BOARD

A. Install substrate board over rigid insulation with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3.5 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

1. Continuously seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

C. Coordinate with roofing manufacturer location of vapor retarder.

3.6 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

1. Where installing composite and non-composite insulation in two or more layers, install none-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

G. Install slip sheet over insulation and immediately beneath membrane roofing.

3.7 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.

1. For in-splice attachment, install membranes roofing with long dimension perpendicular to steel roof deck flutes.

B. Start installation of membrane roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten TPO sheet to roof deck.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.

2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

I. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weather tightness of transition.

3.8 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Installation Inspections: Engage a full-time field quality control inspector during roof system installation. The field quality control inspector shall submit inspection report at weekly intervals to Contractor and COTR and coordinate with roofing system manufacturer's technical personnel and inspect roofing installation upon completion.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to COTR.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07543

SECTION 07600 - FLASHING & SHEET METAL

PART 1 – GENERAL

1.1 SCOPE

All flashing will be installed as part of the roofing manufacturer's approved roof system. Sheet metal work shall be accomplished to form weathertight construction. Work shall be installed without waves, warps, buckles, fastening stresses or distortion and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Exposed edges shall be hemmed. Bottom edges of exposed vertical surfaces shall be angled to form drips. Flashing at the end of a run shall be formed into a three dimensional configuration to direct water to the outside of the system. Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Factory-fabricated components shall be packed in cartons marked with the manufacturer's name or trademark. Bulk materials from which items are field fabricated shall have manufacturer's name or trademark printed or embossed at frequent intervals to permit easy identification. In general, products that are part of the manufacuturer's approved roof membrane system are to be supplied and installed in accordance with manufacturer's installation instructions.

Requirements included - Contractor shall be responsible for all cutting, fitting and patching, required to complete the work or to:

A. Remove and replace defective work.

B. Remove and replace work not conforming to requirements.

1.2 APPLICABLE PUBLICATIONS

The following specifications and standards of the issues currently in force form a part of this section and are applicable as specified herein.

A. Air Movement and Control Association (AMCA)

1. AMCA 500 Test Methods for Louvers, Dampers and Shutters – Latest Edition

B. American Society For Testing And Materials (ASTM)

1. ASTM A 167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip – Latest Edition
2. ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate – Latest Edition
3. ASTM B 221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes – Latest Edition

4. ASTM B 370 Copper Sheet and Strip for Building Construction – Latest Edition
5. ASTM B 486 Paste Solder – Latest Edition
6. ASTM B 506 Copper-Clad Stainless Steel Sheet and Strip for Building Construction – Latest Edition
7. ASTM D 543 Resistance of Plastics to Chemical Reagents– Latest Edition
8. ASTM D 751 Coated Fabrics – Latest Edition
9. ASTM D 822 Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus – Latest Edition
10. ASTM D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds – Latest Edition
11. ASTM E 96 Water Vapor Transmission of Materials – Latest Edition

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1. SMACNA-02 Architectural Sheet Metal Manual – Latest Edition

1.3 SUBMITTALS

Submittals required include, but are not necessarily limited to, the following:

1. Sheet Metal Drawings - Drawings showing weights, gauges, or thickness of sheet metal; type of material; joining, expansion-joint spacing, and fabrication details; and installation procedures. Materials shall not be delivered to the site until after the approved detail drawings have been returned to the Contractor.

PART 2 – MATERIAL

Materials shall conform to the requirements of the roof manufacturer's approved membrane flashing system.

2.1 ALUMINUM EXTRUSIONS

ASTM B 221, Alloy 6063, Temper T5.

2.2 FASTENERS

Fasteners shall be the best type for the application.

2.3 PLASTIC HARDSETTING SEALANT

As recommended by aluminum manufacturer.

2.4 POLYVINYL CHLORIDE (PVC) REGLETS

ASTM D 1784

2.5 SHEET METAL

As recommended by roof manufacturer.

2.6 SOLDER

ASTM B 486, Alloy 50B, for use with copper and Alloy 60B for use with stainless steel

PART 3 – EXECUTION

3.1 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

A. Paint: Aluminum surfaces to be protected shall be solvent cleaned and given a coat of zinc-molybdate primer and one coat of aluminum paint.

B. Nonabsorptive Tape or Gasket: Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and shall be cemented to the aluminum surface using a cement compatible with aluminum.

3.2 SOLDERING, RIVETING, SEAMING, AND SEALING

A. Soldering: Soldering shall apply to copper, copper clad stainless steel, and stainless steel items. Edges of sheet metals, except lead coated material shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of lead coated material to be soldered shall be scraped or wire-brushed to produce a bright surface and seams shall have a liberal amount of flux brushed in before soldering is begun. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a solution of washing soda in water and rinsed with clean water.

B. Riveting and Sealing: Joints in aluminum sheets 0.040 inch or less in thickness shall be made mechanically and sealed with the sealant specified.

C. Seams: Flat-lock and soldered-lap seams shall finish not less than 1-inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.3 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints shall be spaced approximately 1/8-inch apart. The cleat shall be fastened to the supporting construction with nails evenly spaced not over 12 inches on centers, unless otherwise noted. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry. The cleat for fascia anchorage shall be installed to extend below the supporting construction to form a drip and to allow the flashing to be hooked over the lower edge at least 3/4 inch. The cleat shall be of sufficient width to provide adequate bearing area to insure a rigid installation. Where horizontal nailer is vented for insulation and the cleat is placed over masonry or concrete, the cleat shall be installed over 1/16-inch thick metal washers placed at screws. Washers shall be of metal that is electrolytically compatible with the continuous cleat.

3.4 EXPANSION JOINTS

Expansion joints shall be provided at 40-foot intervals for copper and stainless steel and at 32-foot intervals for aluminum, except that where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing an additional joint shall be provided. Joints shall be evenly spaced.

3.5 FLASHINGS

Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls is covered in appropriate sections for such work.

A. Base Flashing

Metal base flashing shall be installed at locations indicated and shall be coordinated with roofing work.

3.6 REGLETS

Reglets shall be a factory fabricated product of proven design, complete with fittings and special shapes as may be required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglets shall be located not less than 8 inches nor more than 16 inches above roofing not having cant strips or shall be located not less than 5 inches nor more than 13 inches above cant strip. Reglet plugs shall be spaced not over 12 inches on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 12 inches to crimp the reglet and cap flashing together.

PART 4 – QUALITY ASSURANCE

4.1 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, weathertight, ventilated areas until immediately before installation.

4.2 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner

* * * END OF SECTION * * *

SECTION 16670 - LIGHTNING PROTECTION SYSTEM

PART-1-GENERAL

1.1 SUMMARY

A. This section includes the installation of a lightning protection system on building roof(s).

1.2 REFERENCE STANDARDS

A. National Fire Protection Association

1. NFPA 70 National Electric Code
2. NFPA 780 Standard for the installation of Lightning Protection System

B. Underwriters Laboratories (UL)

1. UL96A Installation Requirements for Lightning Protection Systems

C. Lightning Protection Institute

1. LPI 175 Standard of Practice for the Design, Installation, and Inspection of Lightning Protection Systems

1.3 SUBMITTAL REQUIREMENTS

A. Manufacturer's Product Data:

B. Submit material specification data for products specified under PART 2 - PRODUCTS.

C. Submit shop drawings for fabrication, erection, wiring and connections to show compliance with NFPA 780 from the lightning protection manufacturer prior to installation.

D. Include plans and elevations at not less than 1/16" to 1'-0 scale with details at not less than 3" to 1'-0" scale.

E. Indicate the complete system cable routing (both horizontal and vertical), all devices, connections, and bonding, penetrations, grounding and ground resistances.

F. Indicate required anchorage and accessory items, field dimensions, finishes, method of connection and routing.

1.4 CERTIFICATES:

A. The installation shall be made by or under the supervision of an LPI certified installer. Obtain and submit installer certification.

PART-2 PRODUCTS

2.1 GENERAL:

A. Provide system material to install a lightning protection system. All material shall be labeled Per UL #96 A and conform to NFPA #780.

B. The system shall be tested for proper grounding in accordance with 3.3 Field Quality Control.

2.2 MAIN ROOF CONDUCTOR:

A. Aluminum, 37 strands of 13 gauge, rope lay 190#/1000 ft.

2.3 AIR TERMINAL AND BASES:

A. Solid round aluminum rod, 5/8" diameter with blunt tip and 5/8" external threaded adapter base or as noted on the plans.

B. New terminal bases shall be of cast aluminum with bolted pressure cable connections and utilize stainless steel hardware. The base-to-roof attachment shall conform to the roof construction and as noted on the plans.

2.4. BONDING PLATES:

A. Cast aluminum bonding plate with bolted pressure cable connector and stainless steel hardware. The configuration shall match the characteristics, cable arrangement and attachment required for bonding with minimum of 8 square inches of contact area.

2.5. CABLE FASTENERS:

A. Electrically compatible with conductor material and to the surface to which it attaches

2.6. CABLE SPLICERS AND CONNECTORS:

A. Cast aluminum, select to be electrically compatible with conductor, with bolt pressure connections and stainless steel hardware.

2.7. MANUFACTURERS:

A. In order to define requirements for material specifications, and provide for total system responsibility all products shall be compatible for connection with existing as furnished by one of the following manufacturers

1. Heary Brothers Lightning Protection, Inc.
2. Independent Protection Company, Inc.
3. Thompson Lightning Protection, Inc.
4. Robbins Lightning, Inc.

PART-3 EXECUTION

3.1 GENERAL:

A. Roof Conductor:

1. Utilize aluminum conductor.

B. Air Terminals and Bases:

1. Utilize aluminum rods.

C. Bonding Plates:

1. Provide bonding plates for cable bonding to all metallic and structural items. Materials shall be electrically compatible.

D. Cable Fasteners:

1. Provide cable fasteners to secure cables.

E. Cable Splices and Connections:

1. Provide bolt pressure cable splices and connectors for all exposed and accessible applications.

3.2 INSTALLATION:

A. The system shall be installed per UL96A, NFPA780, LPI 175, and manufacturer's drawings, data and instructions.

B. Air Terminals:

1. Provide Air Terminals as shown on the Drawings.

C. Conductors:

1. At all connections aluminum to existing copper, bi-metal connectors shall be used. Conductors shall be coursed to interconnect all air terminals so as to provide a 2-way path to ground.

2. The angle of any turn shall not exceed 90 degrees and shall provide a horizontal or downward path. No bend shall have a radius of less than 8".

D. Fasteners:

Conductors shall be secured at a maximum of 3' on center with appropriate fasteners for the cable size and material to which it is fastened.

E. Bonding:

Metallic bodies on the roof shall be connected to the lightning protection system using Class II conductors, fittings and splices.

F. Provide a Letter of Findings in accordance with UL-96A Lightning Protection Installation.

3.3 FIELD QUALITY CONTROL:

A. Test the grounding system to ensure continuity and that the resistance to ground is not in excess of 10 ohms per NFPA 780 Annex "E" using a Biddle meter or equal. Submit results in writing to the COR.

B. Make a visual inspection to verify that all connections have been made firm (ie. not loose causing high resistance).

* * * END OF SECTION 16670* * *